

§ 84.302 Required components, attributes, and instructions.

(a) Each CCER must include components and/or attributes appropriate to its design, as follows:

(1) Eye protection: Each CCER must include safety goggles or an escape hood lens that protects against impact, fogging, and permeation by gas, vapor, and smoke, as specified under § 84.308(c);

(2) Thermal exposure indicators: If the manufacturer specifies a maximum and/or minimum environmental temperature limit for storage of the CCER, then the CCER must include a component, an attribute, or other means by which a person can determine whether the CCER has been exposed to temperatures that exceed the limit(s);

(3) Chemical bed physical integrity indicators: If the CCER includes a chemical oxygen storage or chemical carbon dioxide scrubber that can be functionally damaged by impact, vibration, or any other environmental factor to which the CCER might be exposed, then the CCER must include a component, an attribute, or other means by which a person can detect any damage or alteration of the chemical oxygen storage or chemical carbon dioxide scrubber that could diminish the NIOSH-certified performance of the CCER, as tested under this subpart;

(4) Oxygen storage vessel: If the CCER includes an oxygen storage vessel, the vessel must be approved by the U.S. Department of Transportation (DOT) under 49 CFR part 107, "Hazardous Materials Program Procedures," unless exempted under subpart B of 49 CFR part 107;

(5) Tamper-resistant/tamper-evident casing: If the CCER is not designed for its casing to be opened prior to use for an actual escape (e.g., for maintenance, escape drills, or inspection of the components), the casing must include a component, an attribute, or other means to prevent a person from accidentally opening the casing and, upon such opening, to either prevent the casing from being closed or to clearly indicate to a potential user that the casing has been previously opened; and

(6) Moisture damage indicators: If the CCER is not designed for its casing to be opened for inspection of its internal

components, the casing must include a component, an attribute, or other means by which a person can detect any ingress of water or water vapor that could diminish the NIOSH-certified performance, as tested under this subpart.

(7) Oxygen starter indicators: If the oxygen starter is a critical component of the CCER design, then the CCER must include a component, an attribute, or other means by which a person can detect observable damage, premature activation, or recognized potential defect of the starter.

(b) Where an indicator is required, the indication of the occurrence of the monitored condition must be clear and unambiguous: It must not depend on a subjective interpretation of subtle, graduated, or other non-discrete changes to the indicator.

(c) Where an indicator is required, the manufacturer shall provide NIOSH with an explanation of its function and operation, and shall provide relevant data and equipment to allow NIOSH to conduct a thorough evaluation of its accuracy and reliability.

(d) The components of each CCER must meet the general construction requirements specified in § 84.61.

(e) The CCER must be resistant to the permeation of the breathing circuit by gasoline vapors. To verify such resistance, NIOSH will test one unit by applying the gasoline vapor permeation test specified on the NIOSH Web site at <http://www.cdc.gov/niosh/npptl>, using a breathing machine applying a ventilation rate of 40 liters per minute, performing the test for the longest duration achieved by any of the units that underwent the capacity testing specified under § 84.304.

(f) Exposed parts of the CCER must not be composed of metals or other materials that could, upon impact, create frictional sparks or that could store or generate static electrical charges of sufficient energy to ignite flammable gaseous mixtures.

(g) The design, construction, or materials of the CCER must not constitute a hazard to the user as a result of the wearing, inspection, or use of the CCER.

(h) CCER instructions and a service life plan must be provided to purchasers. This document must be clearly written.

(1) Instructions must address the following topics and elements:

(i) An explanation of how the CCER works;

(ii) A schematic diagram of the CCER;

(iii) Procedures for donning and use;

(iv) Procedures for inspecting the operating condition of the CCER;

(v) Procedures and conditions for storage, including but not limited to any recommended minimum and maximum temperatures for storage;

(vi) Limitations on use, including but not limited to any recommended minimum and maximum temperatures for use;

(vii) Procedures for disposal; and

(viii) Procedures for registration of the unit with NIOSH, pursuant to § 84.311.

(2) The service life must be addressed covering at least the following topics:

(i) The maximum number of years, from the date of manufacture, that the unit may remain available for use; this limit is intended to prevent the continued use of a unit that the applicant cannot assure would continue to perform as approved by NIOSH, due to reasonably foreseeable degradation of materials used in its construction;

(ii) Any other conditions, other than that specified under paragraph (h)(2)(i) of this section, that should govern the removal from service of the CCER (including an indication given by the activation or operation of any required indicator showing the monitored condition has occurred); and

(iii) Any procedures by which a user or others should inspect the CCER, per-

form any maintenance possible and necessary, and determine when the CCER should be removed from service.

(i) Each individual CCER unit approval label shall identify the capacity rating and number of liters of oxygen as determined by the capacity testing, pursuant to § 84.304.

§ 84.303 General testing conditions and requirements.

(a) NIOSH will conduct capacity and performance tests on the CCER using a breathing and metabolic simulator to provide quantitative evaluations and human subjects on a treadmill to provide qualitative evaluations. Information on the design and operation of the simulator is available from the NIOSH Web site at <http://www.cdc.gov/niosh/npptl>. Technical specifications can be obtained from NIOSH by contacting the National Personal Protective Technology Laboratory (NPPTL) by mail: P.O. Box 18070, 626 Cochran's Mill Road, Pittsburgh, PA 15236. Telephone: 412-386-4000 (this is not a toll-free number). Email: npptl@cdc.gov.

(b) Capacity, performance, and wearability tests will continuously monitor the stressors listed in Table 1. The stressors and their respective acceptable ranges will be measured at the interface between the CCER and the mouth by instruments capable of breath-by-breath measurement. Stressor measurements will be evaluated as 1-minute averages. The operating averages of each stressor will be calculated upon the completion of each test as the average of the 1-minute measurements of the stressor recorded during the test. The level of any excursion for a stressor occurring during a test will be defined by the 1-minute average value(s) of the excursion(s).

TABLE 1—MONITORED STRESSORS AND THEIR ACCEPTABLE RANGES

Stressor	Acceptable range operating average	Acceptable range excursion
Average inhaled CO ₂	<1.5%	≤4%.
Average inhaled O ₂	>19.5%	≥15%.
Peak Breathing Pressures	ΔP ≤ 200 mm H ₂ O	−300 ≤ ΔP ≤ 200 mm H ₂ O.
Wet-bulb temperature ¹	<43 °C	≤50 °C.

¹Wet-bulb temperature is a measurement of the temperature of a wet surface. It represents the temperature of the inhaled breathing gas in the CCER user's trachea.